

DERM Conveyance Section

Minimum Requirements for Scheduled Preventative Maintenance Activities

Collection/Transmission System

System Element	Maintenance Activity	Minimum Frequency
Gravity Collection System	Conduct SSES and rehabilitate as needed (refer to DERM's Guidelines for SSES Submittals)	Every ten (10) years (first SSES shall be completed by 11/12/2002 as per Chapter 24)
Portion of Gravity Collection System within the COI of a Wellfield.	Conduct TV inspection and manholes visual inspection. Rehabilitate as needed	Every five (5) years (as per Chapter 24)
Force Mains	Conduct Corrosion Study and rehabilitate as needed	Every ten (10) years
Valves	Inspect/exercise/lubricate	Semi-annually
Air Release Valves	Inspect, Operate and Clean	Quarterly

Pump Station

(Manufacturer's recommendations shall overrule the Maintenance Activities and Minimum Frequencies indicated below)

System Element	Maintenance Activity	Minimum Frequency
Electrical		
Cables - Low voltage power (600 V maximum)	Check condition	Annually
	Inspect connection	Annually
	Inspect raceway	Annually
	Test insulation resistance (for conductors larger than # 10)	Annually
Cables - Medium voltage power (69 KV maximum)	Check condition	Annually
	Inspect connection	Annually
	Inspect raceway	Annually
	Test DC high - potential	Annually
Transformers (Under 10 KW)	Inspect/clean	Annually
Transformers (Over 10 KW)	Inspect/clean	Annually
	Test grounding electrode resistance	Annually
	Test insulation resistance	Annually
Circuit Breakers	Inspect/clean	Quarterly
	Tighten connections	Annually
	Exercise mechanism	Annually
Medium-Voltage Switchgear	Inspect enclosure	Annually
	Check moisture	Annually
	Check ventilation	Annually
	Inspect insulation	Annually
	Inspect breakers	Annually
	Inspect surge arrestors	Annually
	Inspect fuses	Annually

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System Element	Maintenance Activity	Minimum Frequency
Medium-Voltage Switchgear (continued)	Inspect capacitors	Annually
	Inspect batteries	Monthly
	- <i>Water Level</i>	
	- <i>Specific Gravity</i>	
	Inspect transformers	Annually
	Inspect alarms	Annually
	Inspect instruments	Annually
	Check interlocks	Annually
	Check grounding	Annually
	Inspect control relays	Annually
	Inspect conductors	Annually
Motor Control Center	Check operation	Weekly
	Check panel instruments	Weekly
	Tighten connections	Annually
	Check wiring integrity	Annually
	Test interlocks	Annually
	Inspect contactors	Annually
	Inspect motor overload relays	Annually
	Service/lubricate switches	Annually
Contactors / starters	Inspect for overheating	Annually
	Tighten connections	Annually
	Clean contacts	Annually
Variable Frequency Drive Magnetic drive	Check operation	Annually
	Tighten connections	Annually
	Clean exterior/interior	Quarterly
	Inspect ring/magnet	Quarterly
	Inspect brushes	Quarterly
	Check rotor bearings	Quarterly
	Tighten connections	Quarterly
	Inspect for overheating	Quarterly
	Lubricate bearings	As indicated by manufacturer
Ground fault	Check/test	Annually
Elapsed Time Meter	Record Reading	Monthly
	Check Condition	Monthly
Lighting	Check/replace lamps as needed	Weekly
	Clean	Semi-annually
Emergency power		
Engine	Visual inspection (cold engine)	Monthly
	- <i>Check belts</i>	
	- <i>Check hoses</i>	
	- <i>Check for leaks</i>	
	- <i>Check oil level</i>	
	- <i>Check coolant level</i>	
	- <i>Check fuel level</i>	

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System Element	Maintenance Activity	Minimum Frequency
Engine (continued)	- <i>Check air cleaner</i>	Monthly
	Test running	
	- <i>Check starter performance</i>	
	- <i>Check lube oil pressure</i>	
	- <i>Check lube oil temperature</i>	
	- <i>Check speed</i>	As indicated by manufacturer
	- <i>Check fuel pressure (gas/oil)</i>	
	Lubrication	
	- <i>Change oil/filter</i>	
	Change fuel filters	
	Change air filters	
	Clean governor	
	Inspect crankcase/crankshaft	
	Inspect pistons/rings	
	Inspect cylinder/liners	
	Check exhaust system	
	Clean radiators	
	Inspect fuel pump motor	
	Test cooling system	
	Replace cylinder assemblies	
	Replace injectors	
	Replace main bearings	
	Replace water pump seals	
	Inspect connecting rod bearings	
	Inspect rocker arms	
	Check timing	
	Replace governor	
	Recondition fuel pump	
	Replace cooling fans	
	Replace oil pumps	
	Overhaul injectors	
Generator	Test running condition	Monthly
	- <i>Record voltage</i>	Annually
	- <i>Record frequency</i>	
	- <i>Record load current</i>	
	Check annunciator	
	Inspect fuses	
	Inspect collector rings/brushes	
	Lubricate bearings	
	Test insulation resistance	
	Analyze vibration	
	Test positive relays	Annually*
	Replace collector ring brushes	

* Or as recommended by manufacturer based on running hours

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System Element	Maintenance Activity	Minimum Frequency
Generator (continued)	Inspect bearings	Every six (6) years
Battery system	Check electrolyte level	Monthly
	Check specific gravity	Monthly
	Inspect/clean terminals	Quarterly
	Inspect/clean boxes	Quarterly
	Tighten connections	Bi-annually
	Check battery charger	Monthly
Transfer Switch	Test automatic operation	Monthly
	Tighten connections	Annually
	Test insulation resistance	Annually
	Test contact resistance	Annually
	Calibrate timers/relays	Annually
Emergency power receptacle	Check/clean	Annually
Supervisory Controls		
Fuses	Inspect	Weekly
	Tighten connections	Annually
	Clean contacts	Annually
Pressure Switches	Inspect/clean	Annually
Indicating Lights	Check operation	Weekly
Audio/visual alarm	Clean/test	Monthly
Level control - Floats	Check operation	Weekly
	Inspect/clean float balls	Weekly
	Test level alarm	Weekly
Level control - Bubbler	Check operation	Weekly
	Inspect tubing	Weekly
	Check compressor	Weekly
	Replace tubing	Annually
Level control - Ultrasonic	Inspect/clean	Monthly
	Check calibration	Annually
Remote monitoring	Test alarm functions	Semi-annually
	Check battery	Annually
	Test control functions	Semi-annually
Pump sequencing	Check	Annually
Pump operating levels	Check	Annually
Motors		
Synchronous	Check operation	Weekly
	Inspect/Clean	Weekly
	Lubricate bearings	As indicated by manufacturer
	Analyze vibration	Semi-annually
	Measure running current	Semi-annually
	Test insulation resistance	Semi-annually
	Inspect windings	Annually
	Check slip rings	Annually
	Tighten connections	Annually

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System Element	Maintenance Activity	Minimum Frequency
Synchronous (continued)	Replace bearings Rewind motor	As indicated by manufacturer As indicated by manufacturer
Squirrel cage induction	Check operation Inspect/Clean Lubricate bearings Tighten connections Test insulation resistance Measure running current Replace bearings	Weekly Weekly As indicated by manufacturer Annually Semi-annually Semi-annually As indicated by manufacturer
Phase wound induction	Check operation Inspect/Clean Lubricate bearings Analyze vibration Test insulation resistance Measure running current Inspect windings Check brushes Tighten connections Check slip rings Replace bearings Rewind motor	Weekly Weekly As indicated by manufacturer Semi-annually Semi-annually Semi-annually Annually Annually Annually Annually As indicated by manufacturer As indicated by manufacturer
Pumps		
Non-Submersible (Belt-driven)	Check operation Check discharge pressure Check capacity Check packing/mechanical seal Replace packing/mechanical seal Inspect bearings Lubricate bearings Replace bearings Inspect belts/sheaves Replace belts Inspect wear rings Replace wear rings Inspect rotating elements Rebuild rotating elements Check impeller/impeller clearance Analyze vibration	Weekly Annually Annually Weekly Annually Annually As indicated by manufacturer Every three (3) years Monthly Every three (3) years Annually Every three (3) years Annually Every three (3) years Semi-annually Semi-annually
Non-Submersible (Direct Coupled)	Check operation Check discharge pressure Check capacity Check packing/mechanical seal Replace packing/mechanical seal Inspect bearings	Weekly Annually Annually Weekly Annually Annually

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System Element	Maintenance Activity	Minimum Frequency
Non-Submersible (Direct Coupled) (continued)	Replace bearings	Every three (3) years
	Inspect wear rings	Annually
	Inspect rotating elements	Annually
	Rebuild rotating elements	Every three (3) years
	Check coupling	Weekly
	Lubricate coupling	As indicated by manufacturer
	Align coupling	Annually
	Check impeller/impeller clearance	Semi-annually
	Analyze vibration	Semi-annually
Submersible	Check operation	Weekly
	Check discharge pressure	Annually
	Check capacity	Annually
	Check oil level/condition	Semi-annually
	Check stator leakage	Semi-annually
	Inspect cooling system	Semi-annually
	Check impeller/impeller clearance	Semi-annually
	Replace impeller	Every three (3) years
	Inspect wear rings	Semi-annually
	Replace wear rings	Every three (3) years
	Replace mechanical seal	Every three (3) years
	Replace bearings	Every three (3) years
	Inspect cables	Annually
	Check sensors	Annually
	Test insulation resistance	Annually
Sump pump - submersible	Check operation	Weekly
	Inspect/clean	Weekly
Sump pump - vertical	Check operation	Weekly
	Inspect/clean	Weekly
	Lubricate bearings	As indicated by manufacturer
	Inspect impeller	Annually
	Inspect bearings	Annually
	Rebuild impeller	Every three (3) years
	Replace bearings	Every three (3) years
	Replace seal	Every three (3) years
Seal water pump	Check operation	Weekly
	Lubricate motor bearings	As indicated by manufacturer
	Inspect impeller	Annually
	Replace channel rings	Every three (3) years
	Replace mechanical seal	Every three (3) years
Piping and Valves		
Internal piping	Check for corrosion	Annually
	Check pipe restrains	Annually
Valves - Check	Inspect/clean	Weekly
	Inspect Internals	Annually

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Valves - Cone	Exercise	Monthly
	Lubricate	Semi-annually
	Inspect seals	Annually
	Inspect actuator	Annually
Valves - Control	Inspect packing/seals	Weekly
	Lubricate	Semi-annually
	Inspect components	Annually
	Check calibration	Annually
Valves - Discharge	Inspect packing/seals	Weekly
	Lubricate	As indicated by manufacturer
	Exercise	Monthly
Emergency pump connection Valves - Suction	Inspect	Monthly
	Inspect packing/seals	Weekly
	Lubricate	As indicated by manufacturer
	Exercise	Weekly
Auxiliary Systems		
Blowers/Fans	Check operation	Weekly
	Check belt tension	Monthly
	Inspect/clean wheel	Semi-annually
	Lubricate motor bearings	Annually
Air compressor (Hydropneumatic system)	Check operation	Weekly
	Clean air inlet filter	Weekly
	Drain condensate	Weekly
	Check oil level	Weekly
	Clean exterior	Weekly
	Check belt tension	Monthly
	Operate safety valve	Monthly
	Tighten bolts	Monthly
	Change oil	Quarterly
	Inspect compressor valves	Quarterly
	Lubricate motor bearings	Annually
Hydropneumatic system	Check operation	Weekly
	Clean strainers	Annually
	Inspect tank	Annually
	Clean/flush	Annually
	Add oil	Annually
Dehumidifier	Check operation	Weekly
	Inspect/clean	Annually
	Lubricate motor	Annually
Odor control system	Check operation	Weekly
	Check chemical supply	Weekly
	Clean system nozzles	Monthly
Back flow preventer	Check pressure drops	Annually
Crane - bridge	Lubricate bearings	Monthly

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System Element	Maintenance Activity	Minimum Frequency
Crane - bridge (continued)	Lubricate wheels and gears	Monthly
	Check controls	Monthly
	Check wiring/contacts	Monthly
	Check load brake	Monthly
	Inspect hook	Monthly
	Inspect wire rope	Monthly
	Inspect bearings	Monthly
	Inspect hardware	Monthly
	Inspect gearing	Quarterly
	Inspect brake discs	Quarterly
	Inspect lifting devices	Annually
	Inspect Sheaves/drums	Annually
	Perform load test	Annually
Structural		
Station building	Check locks	Weekly
	Check lights	Weekly
	Inspect doors	Weekly
	Check paint condition	Monthly
	Check landscaping	Weekly
	Check housekeeping	Weekly
	Inspect structural steel	Semi-annually
	Inspect ladders	Monthly
	Inspect flooring/grating	Semi-annually
	Inspect roof	Semi-annually
	Inspect fencing	Monthly
	Inspect walls	Semi-annually
	Inspect windows	Semi-annually
Drywell	Check locks	Weekly
	Check lights	Weekly
	Inspect access hatch	Monthly
	Inspect ladder	Weekly
	Check housekeeping	Weekly
Wetwell	Check locks	Weekly
	Inspect access hatch	Monthly
	Inspect ladder	Weekly
	Inspect guide rails	Weekly
	Check for cracks/leaks	Annually
	Clean/vacuum	Every five (5) years